

Avenida de la Playa Storm Drain Upgrades (SD IRWMP Project #178)

Attachment: 7 Flood Damage Reduction Cost and Benefits

The *Avenida de la Playa Storm Drain Upgrades and Dry Weather Diversion* project (Project) is being implemented to address the persistent problem of flooding along Avenida de la Playa and also reduce bacteria loads to the Area of Special Biological Significance (ASBS) as a result of stagnation of low urban runoff flows to the existing storm drain system. The implementation cost of this project is \$4,007,470. Table 7-1 below provides a more detailed break-down of the total project budget.

Table 7-1: Cost Breakdown of Project Costs
Avenida de la Playa Storm Drain Upgrades and Dry Weather Diversion

Cost Category	Total
Planning/Studies/ Design/ Environmental Documentation	\$672,132
30% ; 60%; 90% & 100% Design	\$672,132
Construction/Implementation	\$3,016,000
Construction	\$3,016,000
Mobilization and Site Preparation & Demolition	\$419,018
Project Construction/Implementation	\$2,272,733
Performance Testing and Demobilization	\$324,250
Contingency	\$319,337
Grand Total	\$4,007,470

Refer to Attachment 4 for a detailed budget of the *Avenida de la Playa Storm Drain Upgrades and Dry Weather Diversion* project

Flood Damage Reduction Benefits

The Project is intended to address localized flooding issues in La Jolla caused by the inadequate storm drainage system. Several deficiencies exist in the current system, starting at the outfall structure and continuing upstream into the drainage system servicing the watershed.

The Avenida de la Playa storm sewer system drains approximately 1.28 square miles of La Jolla Shores, a highly urbanized coastal hillside neighborhood in San Diego. Due to significant urbanization, steep slopes, and a highly developed storm drain network in the upper reaches of the system, the watershed is highly responsive to rainfall events, sending fast-moving surges of storm water downstream. Runoff from this watershed is primarily collected and conveyed in the underground storm drain system until it reaches the large series of pipes running along Avenida de la Playa.

The Avenida de la Playa storm drain system was built in the late 1950's and comprises (from downstream to upstream) an outlet structure, 635 feet of twin parallel 51-inch diameter reinforced concrete pipes (RCPs) with a slope of 0.2%, and a 72-inch RCP with a slope of 0.5% which are currently undersized due to development, urbanization and hydromodification that has occurred since the storm drain system was built. During high tide and dry conditions, wave action moves sand inland causing sedimentation in and around the outfall structure, substantially reducing the flow capacity. During intense storm events, flow is restricted at or near the point of discharge, forcing water to back up in the storm drainage system and flood Avenida de la Playa. This flooding often results in dramatic consequences, such as overtopping of the outlet structure and road pavement failure, in addition to the impact of flooding on properties in the area.

In addition, during storm events, trash and debris are transported by runoff flows through the storm sewer system, causing clogging at the outfall structure. This extensive accumulation of trash reduces the capacity of the outfall structure, consequently exacerbating and compounding the problem of flooding with discharges of gross solids and sediment to the state-designated Area of Special Biological Significance (ASBS) via an outfall at the beach. Flooding problems are frequently reported along Avenida de la Playa between the outfall and the intersection with Camino del Sol (approximately 700 feet upstream).

Benefits associated to the Project result from the reduction of localized flooding in this area and will include the following solutions. The new design will include measures to minimize sedimentation in the outfall structure during high tide and eliminate sedimentation in the storm sewers. It will also implement design features that reduce the regular maintenance of the system. The new system will include features to prevent trash from entering the system as the buildup of trash at the outfall creates backwater effects in the storm sewers. By designing features at the drain inlets to retain the trash and prevent it from entering into the storm sewer and outfall, the drainage system will be able to operate closer to maximum design conditions. This consideration will also decrease maintenance requirements. A diversion structure for low flow conditions will be included in a reach of the storm sewer where it can be directed away from the ASBS. five (5) continuous deflective separator units (CDS) will be installed along the storm drain pipe and divert trash from the storm flow after it enters the storm drain network. While it is infeasible to increase the storm drain system to handle the 100-year storm event, the system will be increased to match or exceed the capacity of the upstream 72-inch RCP. This requires the addition of two (2) 51-inch by 90-inch RCBs.

Summary of Benefits

The benefits that are anticipated to result from implementation of the *Avenida de la Playa Storm Drain Upgrades and Dry Weather Diversion* project are summarized below in Table 7-2, and the cost-benefit overview is summarized in Table 7.3. This project will result in flood protection and water quality benefits associated with protection of public and private assets and other property along Avenida de la Playa and other immediate adjoining streets, reducing pollutant discharges of bacteria, sediment and gross solids (trash), and associated increases in recreational uses of Kellogg Park, the La Jolla Shores Park and the La Jolla Ecological Reserve. Detailed cost and benefit information associated with the project, including present value calculations, is provided in Table 10: Appendix 7-1 , and a cost/benefit analysis is presented in Table 20 (Att10SWF_Avenida de la Playa_CB summary 1 of Total 1). A summary of the analysis and the estimate used for flood event probability are provide in Table 11: Appendix 7-2 (Att#7_SWF_Avenida de la Playa_DReduc_3 of Total 7), which include the Event Damage analysis and a graph of the **EAD Loss-Probability Curves for the Avenida de la Playa Storm Drain Upgrades and Dry Weather Diversion** and Table 12: Appendix 7-2 (Att#7_SWF_Avenida de la Playa_DReduc_4 of Total 7), of the proposal.

Table 7-2: Benefits Summary
Avenida de la Playa Storm Drain Upgrades and Dry Weather Diversion
Enhancements for flood Protection Benefits

Type of Benefit	Assessment Level	Beneficiaries
Avoided Damage to Public Assets and Property	Monetized	Local and Regional
Avoided Additional Public Maintenance and Repair Costs	Monetized	Regional
Damage to Private Buildings and Structures	Monetized	Local
Loss of Business Income	Monetized	Local
Increased (abatement of the reduction) in Recreational Opportunities	Qualitative	Local and Regional
Increased in Access and Commerce in flood affected areas	Qualitative	+

Table 7-3: Benefit-Cost Analysis Overview
Avenida de la Playa Storm Drain Upgrades and Dry Weather Diversion

Type of Benefit	Present Value (\$ 2009)
Costs – Total Capital and O&M	Local and Regional
Monetizable Benefit	Beneficiaries
Avoided Damage to Public Assets	\$10,500.
Avoided Additional Public Maintenance and Repair Costs	\$47,000.
Damage to Private Buildings and Structures	\$159,785 - \$359,915
Loss of Business Income	\$8,000 - \$12,000
Qualitative Benefit	Qualitative Indicator
Increases in Recreational Opportunities incl. abatement of the reduction of Recreational Opportunities (ASBS, La Jolla Shores Park & the San Diego La Jolla Underwater Park Ecological Reserve)	+
Increases in Access, Commerce and Economic Opportunities in Frequently Flood Affected Areas	+

Magnitude of effect on net benefits

+/- (negligible or unknown); + (moderate positive); ++ (significant positive) ; - (moderate negative); -- (significant negative)

The “Without Project” Baseline

The without Project baseline for the *Avenida de la Playa Storm Drain Upgrades and Dry Weather Diversion* project would consist of existing conditions associated with flood damage, loss in recreational opportunities, and increased degradation of the ASBS . Information from the City of San Diego indicates that there is incrementally increasing maintenance and losses to public property. For the purposes of this analysis the following estimates were used:

Loss of Business Income

Records by residents and business as to those losses were not well documented and include a high level of variability, therefore a conservative estimate of a net \$500 loss per inundation and flood impacted business day was estimated for eight small to medium size business in the area most prone to flooding based on telephone interviews and site visits by the City.

Avoided Additional Public Maintenance and Repair Costs/Avoided Damage to Public Assets

The average annual cost of the City’s additional maintenance and repair activities has been quantified as \$57,500. The estimate was based on an average of the labor logs(time) and bill of materials used to address additional maintenance activities in the Avenida de la Playa corridor to address the damage cause by flooding or to abate flooding during rain events.

Increased Recreational Opportunities

The damage to property as a result of a storm event of a 1 year, 5 year and 10 year return frequency was analyzed. Data used in the analysis included estimated areas of inundation for pre-project conditions provided by Tetra tech and digital parcel data in GIS format from the San Diego Geographic Information Source (SanGIS, 2008). Parcels that were partially or completely within the 5-year and 10-year estimated inundation areas were identified. The 1-year estimated inundation area appeared to be restricted to the road right of way. Road right of ways are not included in the parcel data. Information derived from parcel data for costing of damage due to flooding included assessor's land value and assessor's improvement value as well as the parcel boundaries. Values were apportioned to the approximate area within the inundation zone. The inundation limits of the probable

zones was developed for hydrology and hydraulic studies performed by Tetra Tech, the engineering design firm contracted by the City of San Diego to design the *Avenida de la Playa Storm Drain Upgrades and Dry Weather Diversion* project. Maps of the inundation zone for the year, 5 year and 10 year return frequency storm, and the probably flood impacted properties are presented as Figures 7-2 (Att#7_SWF_Avenida de la Playa_DReduc_4 of Total 7), and 7-3 (Att#7_SWF_Avenida de la Playa_DReduc_5 of Total 7). A summary of the analysis and the estimate used for flood event probability are provided in Table 11: Appendix 7-2 (Att#7_SWF_Avenida de la Playa_DReduc_3 of Total 7), which include the Event Damage analysis and a graph of the **EAD Loss- Probability Curves for the Avenida de la Playa Storm Drain Upgrades and Dry Weather Diversion**.

Increased Recreational Opportunities

This project directly impacts La Jolla Shores Park, one of the most widely used aquatic resources in the region. Reducing the sediment, gross solids and trash from being discharged at the outfall from the end of Avenida de la Playa will also reduce the amount of these constituents that enter the ASBS. The pollutant load reduction is a result of the high volume and velocity flows which carry sediment and trash to the discharge point. This project will reduce those velocities and include components to remove gross solids and will therefore have a positive impact on the ASBS and therefore be of benefit to the uses of the ASBS and preserve the ecological diversity, viability and quality of the San Diego La Jolla Underwater Park Ecological Reserve.

Improved water quality in the ASBS will allow for additional aquatic activities in this water body, including fishing and swimming. Increases in recreational opportunities specific to this project could not be calculated, and were therefore not monetized.

Increased Access, Commerce and Economic Opportunities in Frequently Flood Affected Areas

Residents in the area report disruption of their activities and commerce through loss of access to the beach, businesses in the area and their properties. Increased threats to structures must be abated by emergency action by the City of San Diego. In order to abate or repair damage or relieve flooding. The increased threat impedes activities which rely on access and impacts commerce and economic opportunities for business and residents in the area as well as creates a stigma of increased flood risk which impacts property values. Increases in access and commerce specific to this project lacked sufficient quantifiable and reliable data and records and so could not be calculated, and were therefore not monetized.

Project Benefits Timeline Description

Flood protection benefits associated with this Project would occur from 2013 to 2047. Flood benefits from this project associated with reducing the flood risk to the private properties and public assets along Avenida de la Playa in La Jolla San Diego.

Distribution of Project Benefits and Identification of Beneficiaries

Table 7-4 summarizes the anticipated beneficiaries of flood damage benefits and water quality benefits that would be provided by the *Avenida de la Playa Storm Drain Upgrades and Dry Weather Diversion* project. Flood protection would benefit the local resident who would have full access and availability of the beach and other recreational amenities at the La Jolla Shores Park and the businesses along Avenida de la Playa which is a major visitor attraction in San Diego and a regional recreational resource. Residences, property owners, and businesses located along Avenida de la Playa and immediately adjoining streets would have the benefit of increased flood protection and reduction of the resulting damage. The residents and citizen of San Diego will realize the benefits of protection of local public assets such as streets, street lighting, signage, traffic lighting and landscaping which need to be more frequently replaced and/or repaired due to continual flood damage.

The water quality improvements would benefit both local water users and regional residents. Local water users that work and/or live in the La Jolla watershed will benefit from improved water quality through avoided health impacts and increased recreational quality. Residents in the region will benefit from improved water quality through avoided health impacts and increased recreational quality in La Jolla Shores Park and Beach and the San Diego La Jolla Underwater Park Ecological Reserve.

The State will realize additional protection of ecological assets within the state-designated Area of Special Biological Significance (ASBS 29) and the San Diego La Jolla Underwater Park Ecological Reserve within that area.

Table 7-4: Project Beneficiaries Summary
Avenida de la Playa Storm Drain Upgrades and Dry Weather Diversion

Local	Regional	State
Local residents in La Jolla Watershed	Regional residents that utilize Kellogg Park ,the La Jolla Shores Park and the La Jolla Ecological Reserve	The users of the San Diego La Jolla Underwater Park Ecological Reserve
Residents and Business along Avenida de la Playa and adjoining streets.	Residents of the City of San Diego resulting from the protection of local public assets such as streets, street lighting, signage, traffic lighting and landscaping.	

Potential Adverse Effects from the Project

Any potential short-term impacts associated with this project will be mitigated through the CEQA compliance process, if necessary. No long-term adverse effects are expected as a result of this project.

Uncertainty of Benefits

Uncertainties relating to the water quality benefits of the *Avenida de la Playa Storm Drain Upgrades and Dry Weather Diversion* project are summarized below in Table 7-5. Uncertainties relating to water quality benefits that could not be monetized, water quality benefits associated with reducing bacteria, sediment loads and trash loads and increased recreational use would have very little impact on the net water quality benefits associated with this project. These uncertainties would be minimal, however, because the project would reduce TSS and TDS discharges and improve water quality in Kellogg Park, the La Jolla Shores Park and the La Jolla Ecological Reserve. In addition, the project's direct influence on recreational use is unknown, and the value associated with recreation of west Mission Bay is unknown because these values were not quantified and/or monetized.

Table 7-5: Omissions, Biases, and Uncertainties and their Effect on the Project
Avenida de la Playa Storm Drain Upgrades and Dry Weather Diversion

Benefit or Cost Category	Likely Impact on Net Benefits	Comment
Avoided Costs of other flood protection projects is not known	-	The probability and cost of other flood protection options such as distributed outfall to the ASBS and detention basin was not studied and the cost benefit with or without the project is unknown.
Reduction in Indicator Bacteria	+/-	Expected discharge reduction values not monetized.
Increase in Recreational Opportunities	+/-	The project's influence on recreational use is unknown. Recreation values not monetized.

Magnitude of effect on net benefits

+/- (negligible or unknown); + (moderate positive); ++ (significant positive); - (moderate negative) -- (significant negative)

Table 10- Annual Cost of Project (All costs should be in 2011 Dollars) Project: <u>Avenida de la PlayaStorm Drain and Low Flow Diversion Project</u> Appendix 7-1									
	Initial Costs	Operations and Maintenance Costs ⁽¹⁾						Discounting Calculations	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
YEAR	Grand Total Cost From Table 4-1 (row (j), column(d))	Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +...+ (f)	Discount Factor	Discounted Costs(g) x (h)
2011	\$672,132			\$47,000			\$719,132	1.000	\$719,132
2012	\$3,335,338			\$47,000			\$3,382,338	1.000	\$3,382,338
2013		\$1,275		\$2,725	\$74,424		\$78,424	1.000	\$78,424
2014		\$1,307		\$2,793	\$74,424		\$78,524	0.943	\$74,049
2015		\$1,340		\$2,863	\$74,424		\$78,627	0.890	\$69,978
2016		\$1,373		\$2,935	\$74,424		\$78,732	0.840	\$66,135
2017		\$2,746		\$5,869	\$74,424		\$83,040	0.792	\$65,767
2018		\$2,815		\$6,016	\$74,424		\$83,255	0.747	\$62,191
2019		\$2,885		\$6,166	\$74,424		\$83,476	0.705	\$58,850
2020		\$2,957		\$6,320	\$74,424		\$83,702	0.665	\$55,662
2021		\$3,031		\$6,478	\$74,424		\$83,934	0.627	\$52,627
2022		\$6,062		\$12,957	\$74,424		\$93,443	0.592	\$55,319
2023		\$6,365		\$13,605	\$74,424		\$94,394	0.558	\$52,672
2024		\$6,684		\$14,285	\$74,424		\$95,393	0.527	\$50,272
2025		\$7,018		\$14,999	\$74,424		\$96,441	0.497	\$47,931
2026		\$7,369		\$15,749	\$74,424		\$97,542	0.469	\$45,747
2027		\$7,737		\$16,536	\$74,424		\$98,698	0.442	\$43,625
2028		\$8,124		\$17,363	\$74,424		\$99,912	0.417	\$41,663
2029		\$8,530		\$18,231	\$74,424		\$101,186	0.394	\$39,867
2030		\$8,957		\$19,143	\$74,424		\$102,524	0.371	\$38,036
2031		\$9,405		\$20,100	\$74,424		\$103,929	0.35	\$36,375
2032		\$28,214		\$60,300	\$74,424		\$162,938	0.33	\$53,770
2033		\$9,875		\$21,105	\$74,424		\$105,404	0.312	\$32,886
2034		\$10,369		\$22,160	\$74,424		\$106,953	0.294	\$31,444
2035		\$10,887		\$23,268	\$74,424		\$108,580	0.278	\$30,185
2036		\$11,431		\$24,432	\$74,424		\$110,288	0.262	\$28,895
2037		\$34,294		\$73,295	\$74,424		\$182,014	0.247	\$44,957
2038		\$36,009		\$25,653	\$74,424		\$136,087	0.233	\$31,708
2039		\$37,809		\$26,936	\$74,424		\$139,170	0.22	\$30,617
2040		\$39,700		\$28,283	\$74,424		\$142,407	0.207	\$29,478
2041		\$41,685		\$29,697	\$74,424		\$145,806	0.196	\$28,578
2042		\$125,054		\$89,091	\$74,424		\$288,569	0.185	\$53,385
2043		\$43,769		\$31,182	\$74,424		\$149,375	0.174	\$25,991
2044		\$45,957		\$32,741	\$74,424		\$153,123	0.164	\$25,112
2045		\$48,255		\$34,378	\$74,424		\$157,058	0.155	\$24,344
2046		\$50,668		\$36,097	\$74,424		\$161,189	0.146	\$23,534
2047		\$152,004		\$108,290	\$74,424		\$334,719	0.138	\$46,191
Project Life									
Total Present Value of Discounted Costs (Sum of Column (i)) Transfer to Table 20, column (c), Exhibit F: Proposal Costs and Benefits Summaries									\$5,677,738
Comments: Design cost realized in 2011 and construction cost realized in 2012. Maintenance and Admin costs based on City of San Diego Sotrom Water Department typical storm drain mainatenace costs and CDS units maintenance estimates.									

(1) The incremental change in O&M costs attributable to the project.